

# Delightful $\delta$ -Lactones

Uses in dairy, fruit, meat and other flavor profiles

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The first time I ever encountered a lactone was eons ago and was, I believe, so-called aldehyde C-18, the misnomer for  $\gamma$ -nonalactone. I was captivated by its coconuttiness and knew at that moment that I was in for a long relationship with anything that ended with “lactone” or “olide.” In fact, I’ve never met a lactone that I haven’t liked, at least not yet. There are many reasons why I like working with lactones as much as I do. Some are purely practical and some a little subjective:

1. They’re ubiquitous in nature. Over the years I’ve encountered lactone citations in everything from ants to zabaglione. Because they’re so widespread, I take their use into consideration when I’m creating a flavor—if not as a main note, certainly as a contributing note.
2. Many are available as naturals, though rather pricey.
3. They’re powerful, meaning a little goes a long way.
4. This power makes them cost-effective, sometimes.
5. Lactones can bring depth to a composition without skewing the main profile, unless one oversteps the dosage line.
6. They can improve and/or prolong aftertaste in a flavor.
7. They imbue the flavor profile with richness, especially in the presence of the higher fatty acids.
8. Many times they can be decreased in a formula—up to 30%, I’ve found—without any major detectible sensory differences.
9. They smell nice. From coconut to musk to an imagined whiff of something ( $\delta$ -tetradecalactone).

Since lactones comprise a fairly large group of compounds, I am initially offering my comments on the  $\delta$ -lactones that are commonly used in the United States for flavor formulations.



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## $\delta$ -Hexalactone, FEMA# 3167

This material occurs naturally in butter, coconut, raspberry, strawberry, tea and beef fat. Its odor is soft, herbal, haylike and oily, with nutty, slight tobaccolike and coconut notes. Flavor-wise, it is sweet, oily and nutty, with warm vanillinlike, caramellic and coconut notes. It is especially useful in brown flavors, particularly caramel, toffee, nuts, rum, cocoa, as well as coconut and vanilla flavors.

## $\delta$ -Octalactone, FEMA# 3214

This ingredient is found naturally in apricot, blue and cheddar cheeses, pineapple, and yogurt. When compared to  $\delta$ -hexalactone, the herbal, tobacco, haylike notes are not evident. The odor is creamy, oily, nutty, coconut (more pronounced flaked coconut) and slightly brown. The taste is creamy, oily, sweet, flaked coconut, with a melted butter aftertaste. Appropriate applications are coconut, of course, and dairy flavors, particularly milk, cream and yogurt to lend creaminess and body. Nuts, particularly pecan and hazelnut, caramels, toffee, and milk chocolate would also be good uses for this component.

## $\delta$ -Nonalactone, FEMA# 3356

This material is found in nature in animal fats, primarily in beef and pork, milk fat, whiskey, wine. Interestingly enough, it is not found in coconut, although its  $\gamma$ -isomer is, and is characterizing for it. The odor is slightly musty, oily, slightly tallowlike, with buttery, coconut afternotes. Its taste is again oily, softly coumarinic, sweet, vanillalike and milky. This is a lovely material for fresh and cooked milk flavors at low levels, also butter, vanilla cream, caramel and toffee flavors.

## $\delta$ -Decalactone, FEMA# 2361

This material has been found in beef, chicken, pork, sheep fats, butter, mango, nectarines, osmanthus, rum, tea and white wine. The odor of this component is musty, slightly floral, oily, slightly coconutlike, fruity (peach, apricot), with a faint melted butter note. Upon tasting,



it imparts a weightiness in the mouth, with slightly floral, oily, fruity (peach, apricot), sweet, buttery notes following. This component works very well in peach, apricot, and mango flavors, cold and melted butter flavors, young cheeses like Colby to reinforce buttery richness, and caramel and toffee flavors to enhance rich aftertaste.

### **$\delta$ -2-Decenolactone (Natural), FEMA# 3744**

This lactone occurs naturally in massoia oil and is conveniently known as massoia lactone. It is also found in tuberose, molasses, the aforementioned ants and tobacco. The odor of this material is sweet, slightly musty, coconut-like, slightly sharp, oily and creamy. Its taste is coconutlike with perfumey and floral notes, and with oily and creamy facets. This material is very powerful and can be used at low levels in dairy flavor formulations as well as coconut, vanilla, peach, apricot and mango flavors.

### **$\delta$ -Undecalactone, FEMA# 3294**

This material has been found in beef fat, blackberry, butter and coconut. The aroma is musty, slightly peachlike, metallic, tallowlike, dairy, creamy, with an underlying melted butter note. Its taste is tallowlike, melted butter, peach/apricot and sweet. Very good uses for this chemical are melted butter, cooked milk, cream, peach/apricot, pear and plum flavors, where it adds body.

### **$\delta$ -Dodecalactone, FEMA# 2401**

This ingredient is occurs naturally in butter, sherry, blue and cheddar cheeses, rum, coconut, strawberry, pork fat, and pineapple. The odor is sweet, fruity, peach, oily, slightly waxy, and slightly buttery. It is especially good in cold, melted and browned butter flavors used in conjunction with  $\delta$ -decalactone, as well as cream, cooked milk, cheese, toffee and caramel flavors.

### **$\delta$ -Tridecalactone, FEMA# 4685**

This material was recently added to the FEMA GRAS list and will be reported on in a future article.

### **$\delta$ -Tetradecalactone, FEMA# 3590**

This ingredient is a naturally occurring component in beef, chicken, pork and sheep fats, butter, coconut, milk, and blue and cheddar cheeses. Its odor is very faint and slightly waxy. Its taste is weighty in the mouth (adds body), fresh milk and slightly waxy. This is a very nice material for enhancing cooked milk, caramel and toffee flavors, cream, sour cream, and fresh cheeses like mozzarella and cottage. It is also helpful for extending the rich aftertaste in dairy-type flavors.

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